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# Multi-angle Imaging SpectroRadiometer

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**STATUS**

**Presentation to SWAMP**

**David J. Diner**

**3 April 1997**



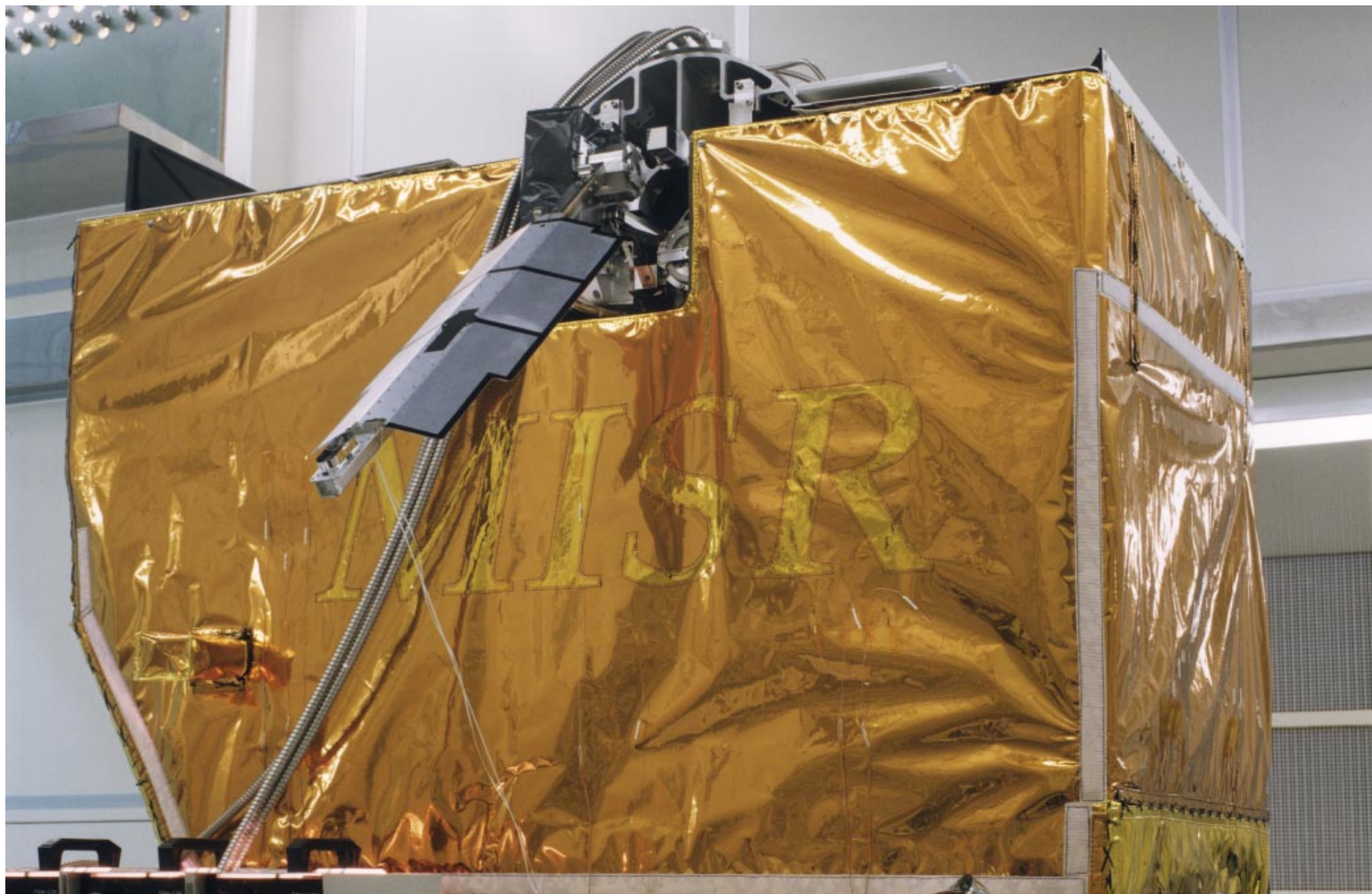
**Jet Propulsion Laboratory**  
California Institute of Technology

- **System integration**

- Thermo-vacuum test held in December 1996 successful in verifying instrument thermal design
- Test indicated problems in system and camera power distribution. Modifications were made and these are now resolved
- Problems were also encountered with system electronics, particularly with regard to high rate science data. These are now resolved
  - Loss of synchronization between data packet headers and contents: Field-Programmable Gate Arrays have been redesigned and flight software modifications made. System now operates properly, including required high data rate configurations
  - Intermittent data corruptions (frequency 0.1 - 0.5%): Observed on test bench but not in instrument. Instrument has better cable shielding and chassis grounding
  - Intermittent failure to begin sending high rate data: Observed during 12/96 thermal vacuum test. Suspected interrupt handling problem. Modifications made; has not recurred in latest testing
  - Flight computer shutdown: Possible power-on reset in response to power variations. Problem has not been observed since power system modifications were implemented

- **Schedule**

- Flight system has been successfully retested at ambient. Thermo-vac II planned for later this month to verify system design modifications over temperature
- Delivery planned for early May



***Instrument in JPL thermo-vacuum facility with Collimator Array Tool (CAT)***



**Ceiling crane (1 ft/second motion)**

**10' suspended target**

**MISR instrument  
(thermal blanketing folded back)**

- **Camera calibration**

- AirMISR camera has been radiometrically, spectrally, and geometrically calibrated

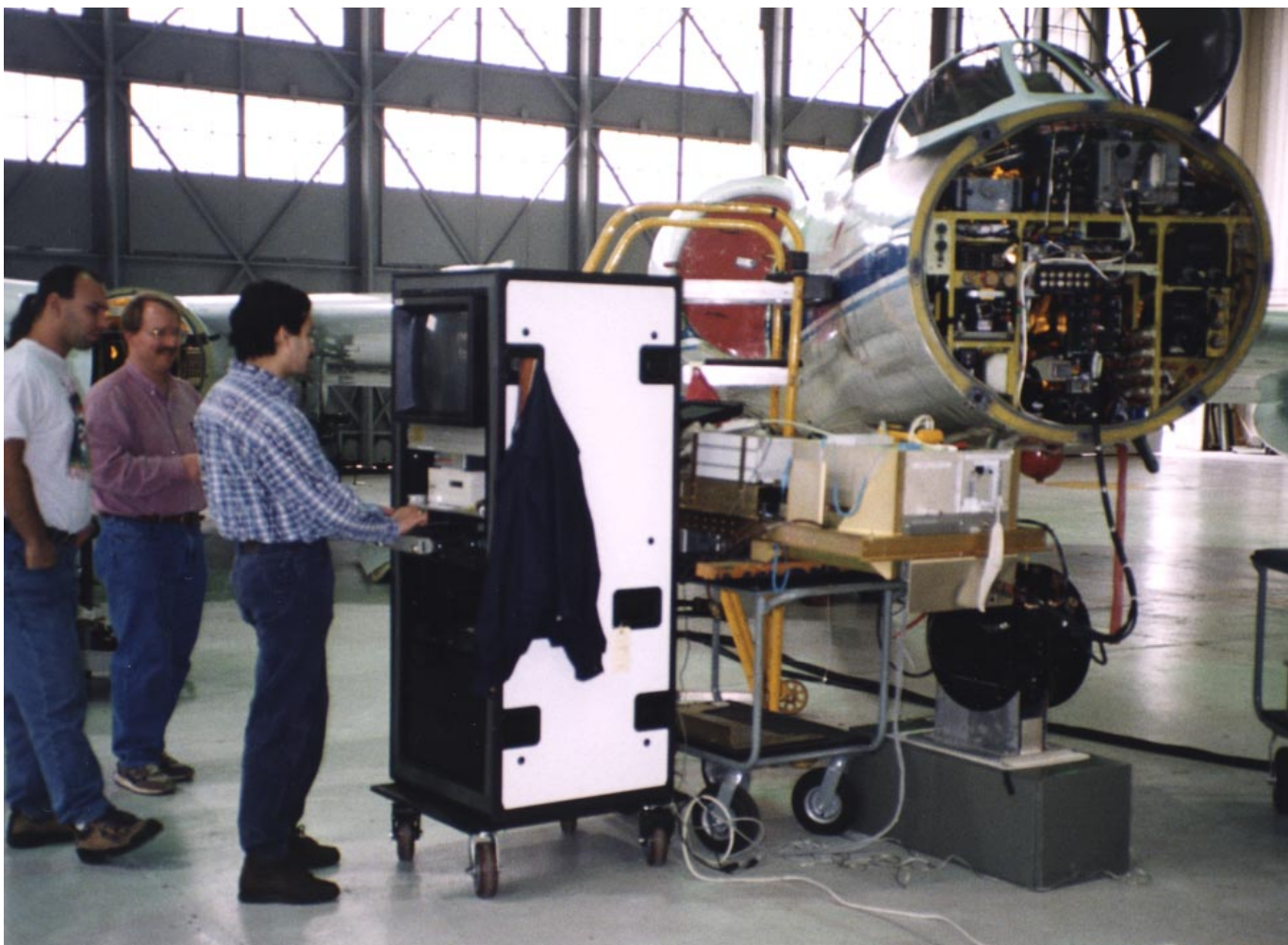
- **System integration: status as of 4/1/97**

- Instrument at NASA Ames undergoing final checkout in readiness for first engineering flight
  - A clearance problem between a shield in the aircraft nose and the rotating camera gimbal was being worked

- **Ground data software**

- MISR ground data software team is developing algorithms and software for radiometric and geometric processing of AirMISR data





***Instrument undergoing checkout with ER-2 aircraft in hangar at NASA Ames***

- **Algorithm and product documentation**

- Recently completed revised draft of Level 3 ATBD
- Validation ATBD in preparation
- Draft data products ICD in preparation. Delivered L1B2 format descriptions to MODIS

- **System development**

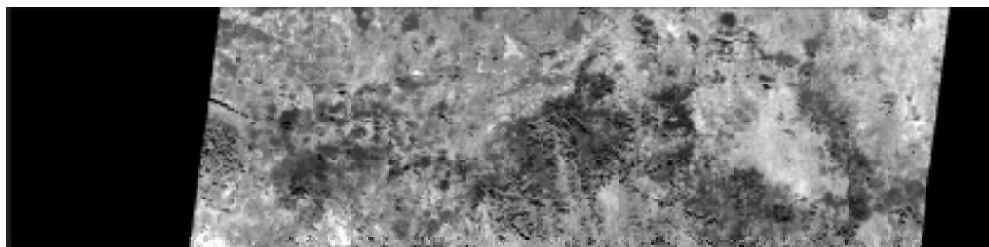
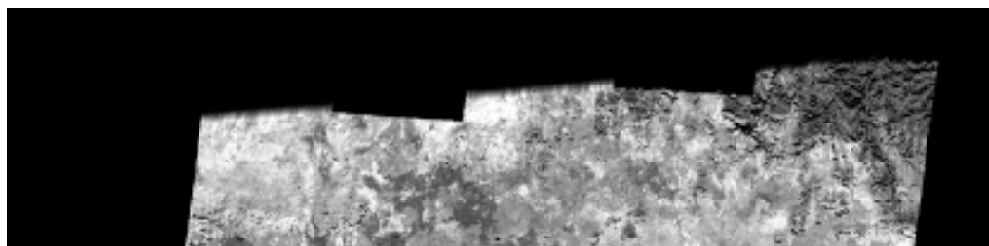
- Completed V1.0 of Level 1 production software, the first occasion on which the complete PGE 1 has been demonstrated. Began use of PGE 1 to determine integration procedures for DAAC delivery
- Began incorporation of HDF EOS product formats, metadata, and SDP Toolkit 5.1.1 into Level 1 software
- Level 2 software implementation continuing in area of individual routines and overall software structural elements
- V1 software scheduled for delivery to LaRC DAAC in 7/97

- **Backup/emergency planning**

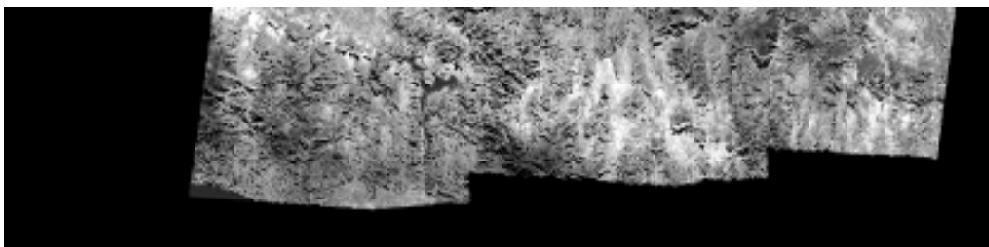
- Prepared proposals for ESDIS. More details from Graham Bothwell

Landsat TM data reverse-processed to generate MISR Level 0 data packets  
Processed through Level 1 to Space-Oblique Mercator projection

3 blocks of data, each 140.8 km x 563.2 km



Df camera, red band  
275-m sampling  
Central Mexico





- **Schedule and funding for completion of instrument**
  - Must balance requirement for adequate testing against delivery schedule
- **No identified funding for instrument engineering support during mission**
  - Engineering staff originally would have been available under plan to transition to AM-2
- **Reduction in planned science carry-over at end of FY97 adds risk to FY98**
  - In FY97, MISR science ran out of money at beginning of December. Funds did not go on-line until 18 weeks into fiscal year
- **Science software development schedule is tight**
  - Will not be able to accommodate scope changes until after launch. This may affect revised FPAR product recommended by ATBD review board, unless rescopes are made
- **Availability of EOSDIS at launch**
  - “Emergency” plan allows for processing of only 1-2 orbits/week

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**LEVEL 3 PRODUCTS**  
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**JPL**  
Jet Propulsion Laboratory  
California Institute of Technology

- **Modeling grid**

- Global, equal-angle  $1^\circ \times 1^\circ$  cylindrical grid (SWAMP). Data accumulated monthly

- **Implementation approach**

- MISR's original implementation plan did not include Level 3 products at launch. They are now included as a result of direction from SWAMP, but this is an unfunded upslope, and therefore level-of-effort
  - Earliest possible inclusion of Level 3 products is in Version 2.1 software
  - Level 3 ATB currently being developed by Science Team, in conjunction with "white papers" describing early mission science. Aim is to facilitate "product to publication" process by linking specific research topics to specific MISR products while remaining accountable to both the public and scientific communities



# AT-LAUNCH LEVEL 3 PRODUCTS (REVISED)



Product name	Contents
Global Radiation Product (MIS06)	<ul style="list-style-type: none"><li>• Statistical summary of red band top-of-atmosphere bidirectional reflectance factors (BRF) for various subregion classifications</li><li>• Statistical summary of spectral restrictive albedos for these classifications:<ul style="list-style-type: none"><li>-- High confidence clear sky, aerosol amount = clear</li><li>-- High confidence clear sky, aerosol amount = hazy</li><li>-- High confidence clear sky, aerosol amount = turbid</li></ul></li><li>• Statistical summary of spectral expansive albedos for these classifications:<ul style="list-style-type: none"><li>-- High confidence clear sky</li><li>-- Clear sky</li><li>-- All sky</li></ul></li><li>• Land/water coverage data</li></ul>
Global Cloud Product (MIS07)	<ul style="list-style-type: none"><li>• Statistical summary of altitude-binned scene classifier</li><li>• Statistical summary of high confidence cloudy and clear fractions</li><li>• Land/water coverage histograms</li></ul>

<b>Product name</b>	<b>Contents</b>
Global Aerosol Product (MIS08)	<ul style="list-style-type: none"><li>• Statistical summary of compositional model-specific column aerosol 555 nm optical depths</li><li>• Histogram of aerosol compositional type</li><li>• Histogram of “best-estimate” regional median column aerosol 555 nm optical depth</li><li>• Algorithm type statistics</li></ul>
Global Surface Product (MIS09)	<ul style="list-style-type: none"><li>• Statistical summary of directional hemispherical reflectance, each of the four MISR spectral bands</li><li>• Statistical summary of directional hemispherical reflectance, photosynthetically active spectral region</li><li>• Statistical summary of fractional absorbed photosynthetically active radiation (FPAR)</li><li>• Statistical summary and histograms of land surface BRF model parameters, classified into six vegetated and one non-vegetated types</li><li>• Land surface classification data</li></ul>



## LEVEL 3 AT-LAUNCH RESOURCE REQUIREMENTS (REVISED)



Product name	Intermediate volume allocation (AHWGP)	Intermediate volume requirement
Global Cloud Product	4.4 GByte	4.8 GByte
Global Radiation Product	7.4 GByte	0.4 GByte
Global Aerosol Product	13.1 GByte	2.9 GByte
Global Surface Product	13.1 GByte	0.3 GByte
Total (monthly)	38.0 GByte	8.4 GByte

Product name	Product volume allocation (AHWGP)	Product volume requirement
Global Cloud Product	100.0 MByte	66.7 MByte
Global Radiation Product	100.0 MByte	113.1 MByte
Global Aerosol Product	100.0 MByte	57.6 MByte
Global Surface Product	100.0 MByte	160.5 MByte
Total (monthly)	400.0 MByte	397.9 MByte